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*The nation's largest
independent classified
employee association*

*Member of the National
Association of Classified
School Employees
(NACSE), representing
independent public
employees throughout
the nation*



December 18, 2002

Mr. Bill Pennington
Project Manager
Energy Efficiency and Demand Analysis Division
California Energy Commission
1416 Ninth St. MS-28
San Francisco, CA 95814

Re: Indoor Air Quality Standards
Title 24, Part 6, Section 121(c)(4)

Dear Commissioners:

On November 18, 2002, the California School Employees Association (CSEA) received a copy of the California Energy Commission's draft proposed regulations. As set forth in the CEC draft, these Demand Control Ventilation devices would restrict the fresh air coming into a building so that 1/3 or less of the current minimum fresh air would come into a school classroom.¹ CSEA is of course concerned about energy conservation. However, the CEC has pointed to no field studies in schools, which show that demand control ventilation devices designed in this manner will work in the school environment without harming the health of school children and school employees. CSEA strongly opposes the proposed changes to Title 24, Part 6 §121. CSEA is the largest union representing classified school employees in the California. CSEA currently represents over 200,000 custodians, maintenance workers, bus drivers, instructional aides, secretaries and cafeteria workers, who will be affected by your draft proposed regulation.

I. The System As Proposed Will Not Provide Adequate Fresh Air

The technology works by restricting the flow of fresh air when the system detects that there are fewer people breathing in the room as represented by carbon dioxide concentration. It costs more to heat or cool outside air, when that air is colder or hotter than ideal indoor temperatures. Therefore, it would often be cheaper to run Heating Ventilation and Air Conditioning (HVAC) systems without any outside air. The problem is that if you don't include fresh air, the people in the rooms become sick. This problem is known as sick building syndrome.

¹ (See reference notes attached at the end of this letter. CSEA will provide copies of these references upon request.)

The current minimum standard for outside air (fresh air) coming into a building is 15 cubic feet per minute per person. This new standard would replace this standard with a .15 cubic feet per minute per square foot standard, and would use the levels of CO₂ (that is the carbon dioxide that people breathe out) as an indicator that outside air needs to be increased. This system is supposed to respond to people's breathing (increasing levels of carbon dioxide, CO₂), by increasing the flow of fresh air when the system recognizes that there are people breathing in the room who need fresh air.

However, because of the way that this standard has been proposed, only a small amount of fresh air will come into a school building until the sensors detect that the carbon dioxide levels (caused by the people breathing in the room) increase to 1100 ppm (parts per million). Sick building syndrome is associated with carbon dioxide levels in a room that exceed 800-1000 ppm.

School ventilation systems are frequently turned off at night, and then 30 or more people occupy the buildings all at once for six or seven hours. Therefore, it is important to incorporate into any standard applicable to schools a requirement that the ventilation be brought up early enough so that sufficient fresh air enters the room before students arrive, and to assure that the ventilation provided is at adequate levels to avoid sick building syndrome and other health problems.

Under the protocols proposed by the Commission, when school starts and 30 children and employees begin breathing, the systems will assume that the building is vacant and will provide very limited fresh air. The ventilation system will not even register that there are people present, and will not begin to increase the fresh air until the people breathing in the room raise the levels of CO₂ to 1100 ppm, which is above the levels associated with increased risk of sick building syndrome. It will then take several more hours for the ventilation system to increase the fresh air and to equalize it in the room enough to fix the lack of fresh air in the room, and to remove the odors and contaminants that have built up. Of course, if the sensors are not working perfectly to recognize that there are people breathing in the room, or if the sensors are not located where the people are breathing, it will take even longer for the system to adjust. See Seppanen, O.A. Fisk, W. J., and Mendell, M.J., "Association of Ventilation Rates and CO₂ Concentrations with Health and Other Responses in Commercial and Institutional Buildings."

Because the Demand Control Ventilation devices work by restricting the fresh air when there are fewer people breathing in a room, e.g. before school in the morning, these systems could result in poor indoor air quality for several hours every morning while the systems respond to the detected level of carbon dioxide in the classroom. Thus for several hours every school morning, the sensors will

have to adjust the ventilation to accommodate the people breathing in the room. Additionally, the minimum ventilation set forth in this proposal is below the standard for healthy breathing. Thus during several hours each day, school children and employees will be breathing inadequate outside air at sick building levels. These facts mean that it is likely that the Commission's requirements will result in students and employees being without adequate fresh air for a significant portion of every school day, and that the Commission's design provides for an unacceptably low level of fresh air in classrooms.

II. There Has Not Been Adequate Field Testing In Schools

Even the Commission's own materials show that most of the field studies of demand control ventilation have been performed in office buildings; there have been few field studies testing the use of these devices in schools, and the Commission has identified none of them which use the protocols included in the draft proposals. It is premature to say the least, to require such systems to be implemented, without at least checking their effect in the school environment in which they will be used.

The school environment is not the same as the office environment. The fresh air that people require is affected by the density of occupancy and by the activity of the people in the rooms. Both density and activity are very different in school buildings than in office buildings. Four times as many people typically occupy a school building than occupy an office building of the same size. Children are more physically active than office workers. Children breathe more than adults for their body size. Thus, fewer people, who are sedentary adults, typically occupy office buildings, while in the same sized buildings, more people, who are active children, occupy schools. See Kinshella, "Perceptions of Indoor Air Quality Associated with Ventilation System Types in Elementary Schools":

Indoor air quality problems in schools may be very different from those observed in commercial office buildings. One of the primary reasons for this difference is that school occupancy is generally more dense, with the typical school averaging four times as many occupants per square foot as the typical office building. These higher occupant densities combined with lower ventilation rates may lead to an increased incidence of infectious diseases, as well as odor and comfort complaints. In addition, with today's educational budget restraints, maintenance departments, responsible for the proper functioning of the building ventilation equipment, are being required to undergo budget reductions more frequently than other departments perceived to be more beneficial to a child's education. (Kinshella p. 952.) Emphasis supplied.

Physical activity increases sweating and body odor, which increases the need for outside air ventilation. Physical activity increases the need for oxygen 2-3 times the rate used by a sedentary office worker. (See Emmerich Study, p. 2-3.)

Because this technology works by monitoring the carbon dioxide in the air; it does not take into account other contaminants that need to be vented, which are present in schools, but not typically found in office buildings. Toxins and odors caused by physical activity, art projects, science experiments, pet odors and dander are present in schools and they require ventilation.

Schools in this State frequently have old equipment and severe financial limits on maintenance budgets. Remodeling and new construction are generally low bid, which means that the systems purchased may not be top of the line sophisticated systems. Economic demands frequently require that the schools make cuts in the very maintenance and custodial staffs who maintain and adjust the systems to assure adequate performance. Therefore, it is important to assure that any energy saving requirements also contain sufficient controls to assure the health and safety of the students and employees who will spend about 1/3 of their waking hours in these buildings.

For all of these reasons, studies conducted in office buildings are unlikely to be valid in school buildings.

III. Inadequate Fresh Air Can Cause Illness and Decrease Productivity

This State has invested huge amounts in training staff and testing children in order to increase school attendance and to improve students' performance. If this proposal is adopted, and the demand control devices do not work as the CEC hopes, our children and employees will be deprived of the fresh air that they need to maintain health and to perform well. Thus adequate fresh air is absolutely vital in assuring that important State policies to improve school performance are not disrupted.

It is well documented that people become sick when they remain in buildings with insufficient fresh air. This condition is referred to as sick building syndrome, (SBS). Increased fresh air (outdoor air) prevents infection and respiratory illnesses, which school children particularly suffer. Several studies have shown that decreases in the fresh (outside air) coming into buildings will increase the number of sick days, and will decrease work performance. These adverse effects occurred even when the outdoor air entering the buildings remained at the current level, which this proposal would reduce.

Further, because children spend approximately 1/3 of their time in school, and because their immune systems are underdeveloped and they are more physically active than adults, they are more vulnerable than adults to inadequate ventilation. The incidence of asthma in school children is a growing problem.

See Schieff, “Air Quality in a Middle School, Part I, Use of CO₂ as a Tracer for Effective Ventilation”:

Like large office buildings, school environments may be influenced adversely by deficiencies in ventilation which may due to improper operation of HVAC systems, attempts at energy efficiency that limit the supply of outdoor air, or remodeling of building components. Most importantly, children spend at least a third of their time in these structures...

Children are considered to be especially vulnerable to environment-related health problems because of their underdeveloped ability to communicate concerns and their increased susceptibility to disease. School environments can be a reservoir for a variety of biological agents including viable and non-viable bacteria, fungi genera, and animal antigens which may pose a threat to these sensitive individuals... Chronic exposure to these allergens has been associated with the development of asthma, atopic dermatitis, and allergic rhinitis. At p. 824.

In the BASE Study –“Associations between Indoor CO₂ Concentrations and Sick Building Syndrome Symptoms in U.S. Office Buildings,” the authors found that sick building syndrome (SBS) was associated with the following symptoms:

In these studies, indoor CO₂ concentrations were associated with headache, fatigue, eye symptoms, nasal symptoms, respiratory tract symptoms... The respiratory symptoms included throat and lower respiratory symptoms, and difficulty breathing....

The BASE Study authors found “statistically significant higher prevalence of these SBS symptoms, between 1.5 – 6.2 times the prevalence of respiratory and sinus problems in buildings in which the CO₂ levels are near the current minimum levels. (Buildings “with average absolute indoor CO₂ concentrations of roughly 800 ppm (or absolute one hour maximum concentration of about 1000 ppm)” p. 247.)

Similarly, Milton “Sick Leave Associated with Outdoor Air Supply, Humidification and Occupant Complaints,” found that even in buildings which

meet the current ASHRAE standard, that increased sick leave is associated with lowered levels of outdoor air supply in office workers.

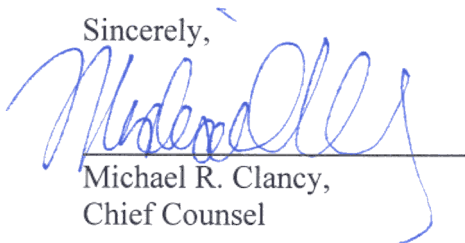
“In the final analysis of ventilation and complaints, we controlled for age, gender hours of non-illness absence, and crowding.... The relative risk of 1.53 for sick leave implied that 35% of short-term sick leave was attributable to lower ventilation among exposed workers, or 1.2 to 1.9 days of increased sick leave per person per year, depending on age and gender....An economic analysis, assuming that the association we have observed is causal (Table 8), shows that the additional cost of delivering outdoor air to workers would be more than offset by the savings from reduced sick leave...” p. 216.

Conclusion

Inadequate fresh air causes sick building syndrome, decreases performance, increases sick days, and causes respiratory symptoms. Thus, if this technology is inadequate, or not properly integrated into school HVAC systems, our children will become sick and will decrease their school performance at precisely the time that the State has made improving the schools a high priority.

The Commission should not require that Demand Control Ventilation devices be used in schools, at least until evidence from field studies in schools show that this design provides adequate fresh air to maintain the health and well being of the students and employees in these school buildings.

Sincerely,



Michael R. Clancy,
Chief Counsel

CC: Maureen C. Whelan, SA